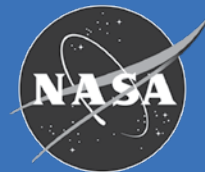


National Aeronautics and Space Administration



NASA SEMAA

2009 Annual Report



NASA SEMAA Science Engineering Mathematics Aerospace Academy

LEADERSHIP REMARKS

NASA SEMAA A NATIONAL LEADER IN K-12 STEM EDUCATION

The space program has a unique ability to inspire students to pursue excellence in disciplines that drive science and technology innovation. As we celebrated the inspiration of the 40th Anniversary of Apollo, NASA's Science, Engineering, Mathematics and Aerospace Academy (SEMAA) continued to excel in preparing the next generation of explorers as it engaged more than 59,000 students, families and educators in 2009. SEMAA's unique longitudinal approach to K-12 student engagement, innovative family involvement component and Aerospace Education Laboratory (AEL) provide a seamless pipeline for elementary and secondary age students, families and educators. This annual report highlights program performance, success stories including student proficiency and educator competence, and innovative partnership linkages throughout the year.

NASA continues to develop explorers to pioneer the future in space exploration, scientific discovery, and aeronautics research. We inspire these next generations to traverse the frontiers of discovery and innovation through a variety of means, including the Science, Engineering, Mathematics and Aerospace Academy (SEMAA) Project. Through SEMAA, we implement the unique concept of partnering with families, educators, and a host of formal and informal institutions to increase the number of students who pursue careers in the fields of science, technology, engineering, and mathematics (STEM).

This year has been an opportunity for the Science, Engineering, Mathematics, and Aerospace Academy (SEMAA) to emerge as a national leader in K-12 STEM education and further establish itself as a critical part of NASA's education portfolio. SEMAA has harnessed the collective resources of NASA, the project's fourteen host institutions, and its 200+ community partners to inspire, engage and educate students. Through the creative use of NASA's unique facilities, expert personnel and compelling missions, SEMAA is supporting local education efforts by laying the foundation that will help strengthen NASA and the Nation's future STEM workforce.

In addition to its primary activities, in 2009, SEMAA successfully connected many of its participants to 58 other STEM education projects, including several NASA internship opportunities. SEMAA is designed to engage students with the STEM pipeline beginning at the earliest level of kindergarten. Through a steady progression of exciting, NASA hands-on learning activities and

As NASA prepares to develop and deploy a next generation of space vehicles, the agency requires greater depth of knowledge and pursuit of innovation than ever before. To ensure success in meeting future exploration goals, NASA and the nation must adapt to the changing landscape and develop new strategies to cultivate its future workforce. With educational investments like NASA SEMAA, innovative seeds of inspiration and engagement for K-12 students, families and educators can better grow into the next generation 21st Century workforce.

Dr. Joyce L. Winterton
NASA Assistant Administrator of Education

The SEMAA Project, established in 1993 as a joint venture between the Glenn Research Center and Cuyahoga Community College, is recognized as a national leader in the efforts to reach K-12 students from groups that historically are underrepresented in STEM fields.

Dedicated to providing a secure future for our nation through a well-educated workforce, NASA is improving the academic success of children nationwide. Through innovative educational projects such as SEMAA, the Agency is inspiring and preparing our youth of today to reach new heights in STEM fields tomorrow.

Woodrow Whitlow, Jr., Ph. D.
Director, NASA John H. Glenn Research Center

diverse exposure to STEM professionals, SEMAA students are introduced to a variety of possible career options. SEMAA also features an innovative component for parents and caregivers, empowering them to become partners in the education of their children and ensure that these students remain in the STEM pipeline through high school and beyond.

Paragon is proud to be an integral partner in all of these efforts, and looks forward to continued success in helping achieve the Agency's education mission of developing America's next generation of extraordinary scholars and innovators!

Gail Dolman-Smith
President & CEO, Paragon TEC, Inc.
NASA SEMAA Contractor

NASA has a unique capacity to impact STEM education in America; utilizing its curriculum, cutting-edge research opportunities, and world-class facilities.

NASA currently invests in a portfolio of educational programs/projects that focus on:

- Strengthening NASA and the nation's future workforce
- Attracting and retaining students in STEM disciplines, and
- Engaging Americans in NASA's mission.

NASA SEMAA is aligned to NASA Education Outcome 2: Attracting and retaining students in STEM disciplines.



MISSION

SEMAA is an innovative, national project designed to increase participation and retention of historically underserved and underrepresented K-12 youth in the areas of Science, Technology, Engineering, and Mathematics (STEM).

GOALS

Inspire a more diverse student population to pursue careers in STEM-related fields.

Engage students, parents/adult family members and teachers by incorporating emerging technologies.

Educate students utilizing rigorous STEM curricula, designed and implemented as only NASA can.

NASA SEMAA IS...



HANDS-ON, INQUIRY-BASED K-12 STEM CURRICULUM ENHANCEMENT ACTIVITIES (CEAs)

- Aligns with national math, science and technology standards
- Encompasses the research and technology of NASA's four Mission Directorates
- Provides NASA SEMAA graduates with up to 441 hours of advanced studies in STEM, prior to enrollment in a post-secondary institution
- Introduces SEMAA graduates to additional external opportunities in STEM education through established program linkages



AEROSPACE EDUCATION LABORATORY (AEL)

- Places cutting-edge technology at the fingertips of middle and high school students
- Engages students in real world challenges relative to both an aeronautics and reduced gravity research scenario
- Houses real aerospace hardware/software, including:
 - An Advanced Flight Simulator (AFS)
 - A laboratory-grade research wind tunnel
 - A working, short-wave receiver and hand-held Global Positioning System (GPS) for aviation



FAMILY CAFÉ

- Promotes sustained family involvement at NASA SEMAA sites nationwide
- Provides parents/caregivers with relevant parenting and STEM education information
- Researches and presents information to parents/caregivers on other STEM-related programs available for their child's participation in an effort to maximize student exposure and interest in STEM



By dramatically improving the participation of women and talent from other under-represented groups in the STEM workforce, the U.S. can leverage the diversity of these individuals to fuel the innovation necessary for our global competitiveness, as well as meet the challenges of a changing world.

The American Society of Mechanical Engineers (ASME), Diversity and Inclusion in the STEM Workforce: a National Priority, April 2009



RISING TO THE CHALLENGE

The NASA SEMAA Project has emerged as a national leader in STEM education. It has successfully connected students to the collective resources of NASA and its host institutions in order to help close the K-12 STEM education gap for our nation's youth.

Through the use of NASA's subject matter, facilities and research opportunities, NASA SEMAA is helping to develop the nation's future STEM workforce and secure America's continued leadership in tomorrow's global workplace.

FOSTERING CONFIDENCE THROUGH COMPETENCE

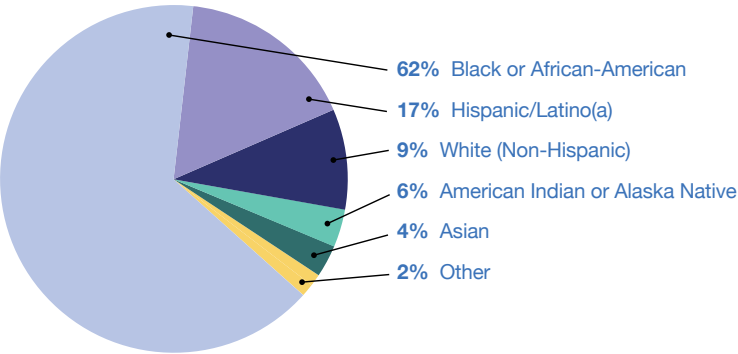
Leigh Arino de la Rubia, education coordinator at SECME/Tennessee State SEMAA, captured SEMAA's impact on student competence in a study of the "Astrobiology in the Secondary Classroom" curriculum.

Pre-test baseline research showed a 25% gap in achievement levels in biology between the site's minority students and their peers of European descent. However, study results showed the achievement gap virtually eliminated after students participated in the SEMAA Project.

2009 SEMAA Student Demographics

- Ethnic Minorities 85% (underrepresented in STEM)
- Low income students 57% (below the national poverty level)
- Students with special needs 5.7% (6%)
- Females 50%

SEMAA Students Ethnic Background



SEMAA is a national K-12 STEM project in the NASA Elementary and Secondary Program education portfolio providing a seamless pipeline for elementary and secondary age students, families and educators.

PART MEASURES

The Office of Management and Budget (OMB) assessed Federal Government programs using the Program Assessment Rating Tool (PART). Questions relate to a program's performance and management. The program ratings range from Effective, at the high end, to Ineffective or Results Not Demonstrated at the lowest end of the scale. All PART evaluations contain follow-up actions and improvement plans. The results are available to the public at www.expectmore.gov.

The NASA SEMAA Project data submitted to NASA's Office of Education in support of the 2009 PART is noted below:

OUTPUT MEASURE

Number of elementary and secondary student participants in NASA instructional and enrichment activities.

- FY 2007 baseline data: 17,773 Direct Student Participants
- In FY 2008 the Project served 18,894 Direct Student Participants
- In FY 2009 the Project served 19,717 Direct Students resulting in an 11% increase since FY 2007
- Additionally in FY 2009, SEMAA served 20,754 Indirect Students for a total of 40,471 K-12 student participants engaged in NASA instructional and enrichment activities



OUTCOME MEASURE

Percentage of students expressing interest in science, technology, engineering and math (STEM) careers following their involvement in NASA elementary and secondary education programs.

- FY 2007 baseline data: 50% or greater level of interest in STEM careers
- In FY 2008, 52% of respondents expressed an interest in STEM careers
- In FY 2009, 81% of respondents expressed an interest in STEM careers, representing a 31% increase since FY 2007

EFFICIENCY MEASURE

Cost per participant for NASA elementary and secondary education programs.

- FY 2007 baseline data: 2% reduction by FY 2009, \$51.03
- In FY 2008, the Project operated at a per participant cost of \$60.52
- In FY 2009, the Project operated at a per participant cost of \$46.55

$$\frac{\$1,913,369 \text{ (2009 Annual Budget)}}{41,101 \text{ (Total Participants = 40,471 students + 630 educators)}}$$

- Additionally, the NASA SEMAA Project served 6,815 SEMAA Parents/Caregivers and 11,730 Outreach Participants during the FY 2009 Family Café component



NEW MEXICO SEMAA STUDENTS OUTPERFORM PEERS ON STANDARDIZED SCIENCE TESTS

"These scores speak volumes in that the students are translating what they are learning into concrete knowledge that can be measured. The superintendents in our area are thrilled. We are connecting with the community and building and polishing the STEM pipeline!"

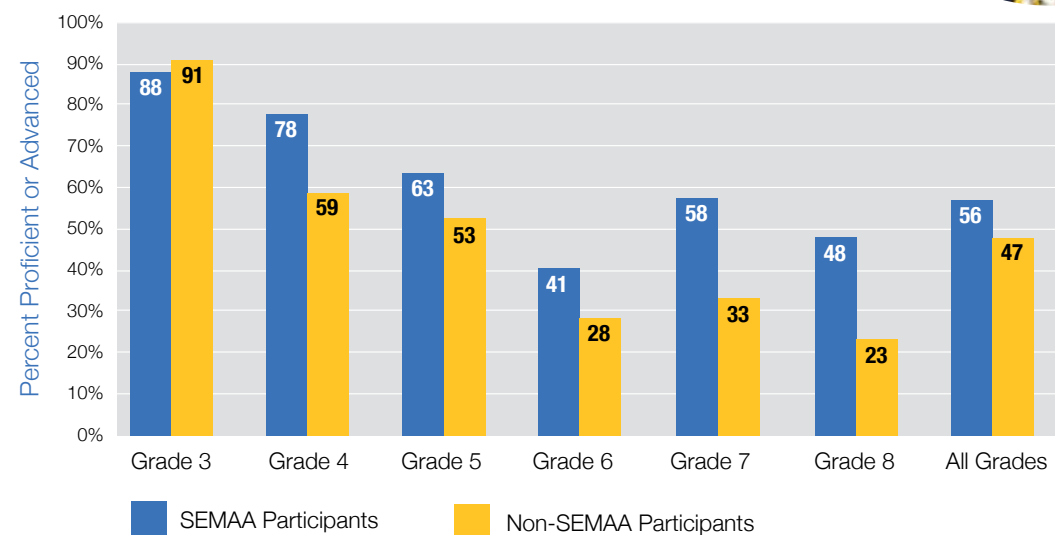
Dr. Karin Wiburg
Research Dean of New Mexico State University College of Education

Study results, from a third-party evaluation of student performance in STEM, show that the students from the NASA SEMAA site at New Mexico State University (NMSU) – Las Cruces outperformed their non-SEMAA peers on the science portion of the state standardized tests. Evaluators collected and analyzed SEMAA and non-SEMAA student science test scores of the 2007-2008 New Mexico Standards-based Assessment (NMSBA) in the Las Cruces Public School (LCPS) District and Gadson City School District.

Overall, 56% of the SEMAA students proved to be Proficient or Advanced, compared to 47% of the non-SEMAA students scoring in the same categories. Furthermore, NASA SEMAA students from New Mexico State University outperformed non-SEMAA students in five of six grade levels in the area of science.



LAS CRUCES PUBLIC SCHOOLS 2008 NMSBA SCIENCE



HELPING PARENTS INSPIRE STUDENTS TO SUCCEED IN STEM

When K-12 education works well, parents/caregivers are actively engaged. In FY 2009, the SEMAA's Family Café provided more than 32,000 total hours of STEM education and parenting workshops.

EXAMPLES INCLUDE:

- Richland County (SC) SEMAA – A special workshop addressed concerns about the new South Carolina academic proficiency tests for student advancement and graduation, and also provided successful test-taking tips for helping to prepare students.
- York College (NY) SEMAA – Several City Council members, a New York State Assembly member, and the local school district's Family Advocate discussed SEMAA and other STEM education resources with over 65 new families.
- Pine Ridge Reservation (SD) SEMAA – Star Gazing Parties addressed astronomy and the legends of the Lakota people. Over 60 attendees observed the cosmos with the aid of telescopes.
- Martinsville (VA) SEMAA – A 100-hour astronomy event commemorated the 400th Anniversary of Galileo's discoveries and the Year of Astronomy in partnership with the Virginia Museum of Natural History. The museum's planetarium was used for several activities.

- Fernbank (GA) SEMAA – NASA Astronaut Eric Boe, a Fernbank Science Center alumnus, interacted with over 6,000 students, teachers, and parents/caregivers during several Astronaut Encounter Events at the Fernbank SEMAA site.

Boe participated in a "SEMAA Family Science Night Out" event, attended a robotics class, and hosted a special NASA briefing for Fernbank planetarium visitors. He also visited several SEMAA partner schools in DeKalb County and spoke to students and families.



"The Family Café provided very intriguing and fascinating information which piqued my interest and awoke my interest in science again. There was great rapport and interaction. It was wonderful to hear suggestions and relevant information being shared by so many others."

NASA SEMAA Family Café Participant

BOLDLY COMMITTED TO NURTURING THE STEM PIPELINE



Strengthening NASA and the Nation's future workforce is one of NASA's major education goals. The SEMAA Project supports this goal by attracting and retaining students through a progression of educational opportunities that serve to maximize their exposure to STEM disciplines.

In addition to the direct STEM education services offered through SEMAA, the 14 NASA SEMAA project sites collectively fostered the participation of SEMAA students in 58 other STEM-focused educational programs and projects including 33 NASA-sponsored Extended Learning Opportunities that were offered through NASA Headquarters and eight of the ten NASA field centers.

Below is a sampling of several of these NASA-sponsored/supported learning opportunities:

DIGITAL LEARNING NETWORK (DLN):

- NASA Explores Virtual Worlds Videoconference
- Kepler Mission Videoconference
- Our Planet Earth Videoconference
- STS-119 and 125 Mission Webcasts

ENGINEERING DESIGN CHALLENGES/COMPETITIONS:

- FIRST LEGO League (FLL) and FIRST Robotics Competition (FRC)
- Great Moonbuggy Race
- Hubble's Next Discovery – You Decide Contest
- Name NASA's Next Mars Rover Contest
- NASA Engineering Design Challenge – Lunar Plant Growth Chamber

INTERNSHIPS:

- Interdisciplinary National Science Program Incorporating Research and Education Experience (INSPIRE)
- Lewis' Educational and Research Collaborative Internship Program (LERCIP)
- Motivating Undergraduates in Science and Technology (MUST)

The NASA SEMAA project continuously strives, both internally and through the collaborative efforts of other STEM-focused educational programs and projects, to develop and enhance students' skills to meet the needs of the 21st century STEM workforce.

“Attending the SEMAA program was the best thing that ever happened to me. It inspired me to major in aerospace engineering, get an internship at NASA and receive my private pilot's license. But my favorite benefit from SEMAA has been learning that I was truly meant to do what I love: explore and learn.”

*Brenna Ditmar
Student/NASA Intern
SECME/SEMAA Tennessee State University*



“These grants are an investment in the future of our teachers and young people and will give them invaluable skills for the future.”

*Patricia Salas Pineda
Group Vice President of Toyota Motor North America*



LINKAGES SUPPORT INNOVATION

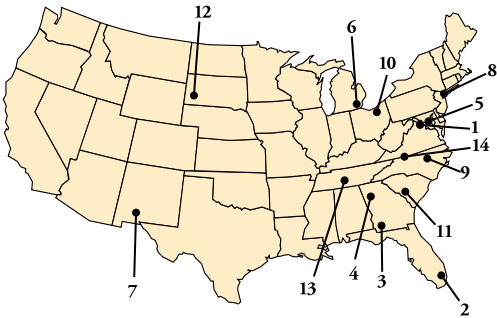
NASA SEMAA sites develop partnership linkages that collectively form a national network of partners to help sustain the SEMAA Project services. During FY 2009, SEMAA sites leveraged more than \$3.5 million in partnership funds (including both financial and in-kind support).

A few examples of partnership investment are:

- **TOYOTA USA FOUNDATION** – Provided a \$162,000 grant to the SEMAA site at New Mexico State University (NMSU) to expand the project to include grades K-2.
- **UNIVERSITY OF THE DISTRICT OF COLUMBIA (UDC)** – Contributed \$80,500 to support their SEMAA site, located in inner-city Washington, D.C. These funds enable the site to attract and retain more students for the NASA SEMAA Project.
- **MARTINSVILLE (VA) CITY SCHOOLS** – Awarded \$65,000 to the SEMAA site to provide for key instruction and to solidify its commitment to the project. The funds provide for program expansion and growth in other key areas of need.
- **AMERICAN HONDA FOUNDATION** – Provided \$60,000 to the SEMAA site at Cuyahoga Community College (CCC) to expand SEMAA and increase the numbers of K-12 student participants in the Greater Cleveland area.
- **NATIONAL SCIENCE FOUNDATION** – Awarded a total of \$113,000 to the New Mexico State SEMAA site to provide students the opportunity to engage in authentic field experiences.
- **WARREN COUNTY (NC) GOVERNMENT** – Contributed \$43,638 to the SEMAA site at Warren County to sustain and enhance the SEMAA Project operations.

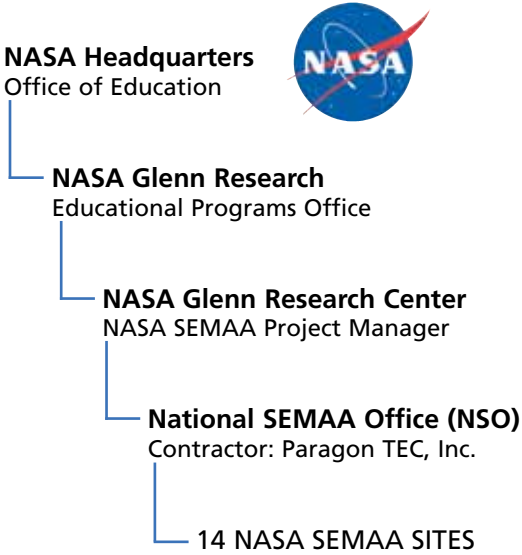


A partial list of 2009 NASA SEMAA partners is included on page 11.



- 1 - **District of Columbia**
University of the District of Columbia, Washington
- 2 - **Florida**
Miami-Dade County Public Schools, Miami
- 3 - **Georgia**
Albany State University, Albany
- 4 - **Georgia**
Fernbank Science Center, Atlanta
- 5 - **Maryland**
Morgan State University, Baltimore
- 6 - **Michigan**
Wayne State University, Detroit
- 7 - **New Mexico**
New Mexico State University, Las Cruces
- 8 - **New York**
York College / City University of New York, Jamaica Queens
- 9 - **North Carolina**
Warren County High School, Warrenton
- 10 - **Ohio**
Cuyahoga Community College, Cleveland
- 11 - **South Carolina**
Richland County School District One, Columbia
- 12 - **South Dakota**
Oglala Lakota College, Kyle
- 13 - **Tennessee**
SECME/Tennessee State University, Nashville
- 14 - **Virginia**
Martinsville City Public Schools, Martinsville

ORGANIZATIONAL CHART



2009 NASA SEMAA BUDGET

NASA SEMAA Site Operations* (14 sites)	\$3,271,000
<i>(Includes \$2.45M CDIs + \$.821M SEMAA Site Operations)</i>	
National SEMAA Office Operations – Contractor	\$900,007
NASA Glenn In-House Costs	\$505,000
Grand Total	\$4,676,000

**Includes 2009 Congressionally Directed Items (CDIs) for the following, existing SEMAA sites:*

- New Mexico State University (\$200,000)*
- York College CUNY (\$250,000)*

**Also includes 2009 CDI for new SEMAA site startup at:*

- West Virginia State University (\$2,000,000)*

(Total SEMAA Base Budget - \$2,226,000, Total Earmarks - \$2,450,000)



- Abington Foundation

Air Force Association

The American Institute of Aeronautics and Astronautics

Albany State University

Albany YMCA

American Honda Foundation

American Horse

Area faith based organizations

Area Health Education Center

Baltimore Housing

Best Buy

Bible Baptist Youth

Boys and Girls Club

Community Book and Dance

Comtel/WPBT Channel 2

Concerned African American Women

ConEdison

Cuyahoga Community College

District of Columbia Employment Services

Department of Agriculture

Dougherty County School District

Earmark

Engineering Information Foundation

Escrap Computers and Electronics, Inc.

Experience Aviation

ExxonMobil Foundation

FCCA Summer Camp

Federal Lunch Program

Fernbank Science Center

FIRST BOOKS

Florida Memorial University

Fluor Corporation

Food Bank of Central NC

Foundation of Community Assistance and Leadership
- Gadsden Independent School District

Halifax Helps

IEEE (Institute of Electrical and Electronics Engineers) Potomac Section

Intel Foundation

Jacob G. Schmidlapp Trust

Keep Miami Gardens Beautiful Committee

Kennedy Space Center and University of Central Florida

Florida Research Foundation

Kenson Browne M-DCPS' AEL Coordinator

Lakeview Baptist Daycare

Las Cruces Public Schools

Life Science Education Center at Marion College

Little Wound

Lively Stones for Jesus Ministries

Martha Holden Jennings Foundation

Martinsville City Schools

Metro Nashville Public Schools

Miami-Dade County Department of Environmental Resource Management (DERM)

Miami-Dade County Public Schools

Morgan State University

National Science Foundation

New Hope Kids Zone

New Mexico State Legislature

New Mexico State University

Oglala Lakota College

Pen Tab Academy

Portrait of Empowerment

Power 96 Radio Station

Project A.R.T.S. (Artists Realized Through Students)

Public Service of New Mexico

Quality United Education, Inc.
- Ronya and George Kozmetsky (RGK) Foundation

Richland County School District One

Science Academy Network (SAN)

Star Ex Camp

State of Florida Science Academy Network at Southeastern Region of Visions in Education (SERVE)

State of New Mexico

Stuart Hill Academic Academy

Tennessee Space Grant Consortium

Tennessee State University

Thomas H. White

Tommy Hilfiger

Toyota Foundation

U.S. Department of Education

United Parcel Service Foundation

University of Miami

University of the District of Columbia

Upward Bound

Warren County Government

Warren County School System

Wayne State University

Windsor Hills Elementary

York College, CUNY



NASA SEMAA PARTNERS





GENERATING GREATER LEVELS OF STUDENT INVOLVEMENT IN STEM

“The SEMAA curriculum is a well designed curriculum that encourages learning and promotes collaboration.”

Odell Ruffin
NASA SEMAA Teacher
University of the District of Columbia SEMAA

“The most valuable part of the SEMAA program was the location and the exposure to a college classroom; the instruction and (hands-on) activities.”

NASA SEMAA Student
Morgan State University SEMAA

“The NASA SEMAA Project is an absolutely wonderful project that should exist at all of our nation’s universities...”

Dr. Arnold Tolbert
Florida Memorial University Aviation Dean